

**WHAT IS CLAIMED IS:**

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3 combining the specularly reflected light intensity with a specular  
4 reflectance coefficient, said specular reflectance coefficient being retrieved  
5 from a specular reflectance coefficient map associated with the surface.

1 8. A method for adding detail to a texture map comprising at least one texture  
2 element, the method comprising the steps of:  
3 generating a detail map; and  
4 assigning a pointer into said detail map to at least one of the texture  
5 elements of the texture map to generate a pointer map, said pointer comprising  
6 two offsets.

1 9. A method as set forth in claim 8, wherein said detail map is organized as a  
2 mip-map.

1 10. A method as set forth in claim 9, further comprising the steps of:  
2 determining a texture address and a level of detail;  
3 responding to said level of detail indicating that detail is needed by,  
4 retrieving offsets from said pointer map;  
5 using said offsets as detail map addresses;  
6 accessing said detail map;  
7 responding to multiple accesses of the detail map by, interpolating  
8 results of the detail map accessing; and  
9 mapping the texture map and the detail map to a surface of a computer  
10 generated object.

1 11. A method as set forth in claim 10, wherein a final pixel color is a combination  
2 of the results of the detail map access operation and a texture map access operation,  
3 said texture map access operation comprising at least one access to the texture map.

1 12. A method as set forth in claim 11, wherein at least one of said texture map  
2 access operation, and said detail map access operation is carried out in real time using  
3 dedicated arithmetic units.

1 13. A device for generating a texture map, environment map, reflectance map and  
2 detail map, comprising:

3 a memory unit for storing at least one of a texture map, an environment  
4 map, a reflectance map, and a detail map; and

5 a dedicated arithmetic unit, responsive to said memory unit, for  
6 generating at least one of said texture map, environment map, reflectance map,  
7 and detail map.

1 14. The device of claim 13, further comprising:

2 a filter unit for generating prefiltered images of less detail; and means  
3 for accessing pixels of a previous half-frame to perform said filtering.

1 15. A device for mapping interlaced real time video images onto a surface of a  
2 computer generated object, each video image including two interlaced half-frames of  
3 pixels, comprising:

4 a filter unit for generating prefiltered images of less detail; and  
5 means for accessing pixels of a previous interlaced half-frame to  
6 perform said filtering.

1 16. A method for mapping a texture onto a surface of a computer generated object  
2 represented by a plurality of pixels, comprising the steps of:

3 dividing a texture map into blocks, the texture map comprising a  
4 plurality of texels, each texel having an associated value;

5 determining two block values for each block, which block values are  
6 representative of the values of texels in the block;

7 compressing the texture map by assigning to each texel one of the  
8 block values associated with the block of which it is part; and

9 mapping said compressed texture map onto the surface of the computer  
10 generated object.

1 17. A method as set forth in claim 16, wherein the block values associated with the  
2 texture map are quantized to a smaller number of bits.

1 18. A method as set forth in claim 16, wherein the step of determining two block  
2 values for each block comprises:

3 calculating a tensor of inertia from texel values;  
4 determining an eigenvector having a smallest eigenvalue from said  
5 tensor;  
6 multiplying said smallest eigenvalue eigenvector with said texel values;

7 and

8                    splitting the texel values in two groups by comparing a result of said  
9                    multiplication with a threshold value.

1 19. A method as set forth in claim 16, wherein the texture map corresponds to a  
2 filtered texture map of lesser detail than a texture map of full detail.

1 20. A method as set forth in claim 16, wherein the step of mapping said  
2 compressed texture map onto the surface of the computer generated object comprises:

for each pixel which represents the computer generated object,  
accessing said compressed texture map at least one time; and  
responding to said compressed texture map being accessed  
more than one time by interpolating results of the accesses.

21. A method as set forth in claim 20, wherein the step of mapping said  
compressed texture map onto the surface of the computer generated object further  
comprises:

approximating true pixel color by performing a number of texturing  
operations according to a geometric shape of a projection of a pixel on the  
texture and averaging results of said texturing operations.

1     22.     A method as set forth in claim 21, wherein the texture is an environment map.

23. A method as set forth in claim 22, wherein at least one of said texture mapping,  
environment mapping, reflectance mapping and detail mapping is carried out in real  
time using dedicated arithmetic units..

- 1 24. A device for at least one of texture mapping, environment mapping, reflectance  
2 mapping and detail mapping comprising:  
3 means for compressing a texture map using blockwise two-level (one  
4 bit) quantization of brightness values or colors;  
5 means for storing said compressed texture map on a storage medium;  
6 means for mapping said stored texture map onto the surface of the  
7 computer generated object;  
8 dedicated arithmetic unit means; and  
9 memory units for storing at least one of texture, environment,  
10 reflectance and detail maps.
- 1 25. A method as set forth in claim 6, wherein combining said specularly reflected  
2 light intensity with a specular reflectance coefficient comprises multiplying said  
3 specularly reflected light intensity by the specular reflectance coefficient.
- 1 26. A method as set forth in claim 7, wherein combining the specularly reflected  
2 light intensity with the specular reflectance comprises multiplying the specularly  
3 reflected light intensity by the specular reflectance coefficient.
- 1 27. A method as set forth in claim 8, wherein a pointer into said detail map is  
2 assigned to each texture element of the texture map.
- 1 28. A method as set forth in claim 11, wherein at least one of an environment  
2 mapping, and a reflectance mapping is carried out in real time using dedicated  
3 arithmetic units.
- 1 29. A method as set forth in claim 21 wherein the texture is a reflectance map.
- 1 30. A method as set forth in claim 21 wherein the texture is a detail map.
- 1 31. The texturing unit of claim 16, wherein each block value represents the  
2 luminance of a texel.
- 1 32. The texturing unit of claim 16, wherein each block value represents an index  
2 into a look-up table.



3 and the four texels from the second level represent a two-by-two block of contiguous  
4 texels within the second level of the mipmap.

1 38. The texturing unit of claim 36, wherein each decompressed texel value  
2 represents an index into a look-up table.

1 39. The texturing unit of claim 36, wherein each decompressed texel value  
2 represents the color of a texel.

1 40. The texturing unit of claim 35, wherein the RAM, the interpolator, and the  
2 output port are part of a single chip.

1 41. The texturing unit of claim 35, wherein the interpolator comprises at least one  
2 dedicated arithmetic unit.

1 42. The texturing unit of claim 41, wherein the RAM, the interpolator, and the  
2 output port are part of a single chip.

1 43. The texturing unit of claim 37, wherein the RAM, the trilinear interpolator, and  
2 the output port are part of a single chip.

1 44. The texturing unit of claim 43, wherein the trilinear interpolator comprises at  
2 least one dedicated arithmetic unit.

1 45. The texturing unit of claim 35, wherein the texture comprises a plurality of  
2 blocks, each block comprising a plurality of texels and having two block values  
3 associated with the block, and each texel of each block corresponding to one of the  
4 two block values associated with the block, the information stored in the RAM  
5 comprising:

6 the two block values associated with each block of the texture; and  
7 a value for each texel, which value indicates the block value to which the texel  
8 corresponds.

1 46. The texturing unit of claim 35, wherein each texel value represents the  
2 luminance of a texel.





